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| 10/781,813 | 02/20/2004 | Tutomu Ikeda | 04022 | 3953 |

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| EXAMINER | |
|---|---|
| WHITTINGTON, KENNETH | |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/781,813 | IKEDA ET AL. | |
| | Examiner | Art Unit | |
| | KENNETH J. WHITTINGTON | 2862 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *14 February 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *27-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *27-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 February 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/6/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

**DETAILED ACTION**

The Request for Continued Examination filed February 14, 2008 and the Amendment filed December 14, 2007 have been entered and considered.

***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the magneto-resistive element comprising an integrated circuit (IC) and containing a self contained control unit as recited in each of the claims, as amended, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. This feature is argued in the Remarks to the noted Amendment as a feature that separates the claimed invention from the prior art and thus must be shown.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet,

and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 27-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. (US5544000), hereinafter Suzuki, in view of Hamaoka et al. (US6483296), hereinafter Hamaoka.

Claims 27-29

Regarding claim 27, Suzuki teaches a rotation angle sensor comprising:

a magnet support having an inner surface and a outer surface (See Suzuki FIGS. 1-3, 9, 13 and 14, item 4);

at least two magnets positioned to produce a magnetic field across a center of rotation, wherein the magnets each include an inner and outer surface and a first and second end portion, wherein the at least two magnets are made of ferrite- based magnetic materials, further wherein each of the magnets outer surface is attached to the magnet support inner surface and each of the magnets first and second ends are spaced from each other in a circumferential direction by gaps; wherein there is no magnetic material along an inner peripheral surface of the at least two magnets, and the at least two magnets are not continuous in a circumferential direction (See Suzuki FIGS. 1-3, 9, 13 and 14, items 2a and 2b);

wherein each of the magnets has an arc-shaped configuration along a circumferential direction (See Suzuki FIGS. 1-3, 9, 13 and 14, items 2a and 2b);

a magneto-sensitive sensor disposed within the magnetic field and arranged and constructed to detect a change of direction of the magnetic field as the magnets and magnetoresistive sensor rotate relative to each other, wherein the magneto-sensitive sensor comprises an IC having a magneto-sensitive element; wherein the magneto-sensitive sensor outputs signals representing a relative rotational angle, and wherein the magneto-sensitive sensor comprises a self- contained control

unit for receiving the output signals and calculating a linear angle output (See Suzuki FIGS. 1-7, 9 and 11-14, sensors 8a and 8b on integrated circuit 27 having signal processing control and components shown as integrated circuit in FIGS. 5-7 with specific components shown in FIG. 11, outputting a signal that is generally linear as shown in FIG. 12).

However, Suzuki does not disclose precisely how the magnets are magnetized, the recited edge portions or the use of magneto-resistive sensors. Hamaoka teaches a rotational angle sensor comprising a pair of arc shape magnets wherein each of the magnets has a pair of opposite end faces; wherein each of the opposite end faces comprises a first surface and a second surface that are respectively inclined relative to an inner circumferential surface and an outer circumferential surface of each of the magnets by obtuse angles and are provided with a magnetization that runs parallel between the magnets (See Hamaoka FIGS. 21A-21C, note magnets 145 and 146). It would have been obvious at the time the invention was made to incorporate the end portions of the magnets and the magnetization as taught by Hamaoka in the apparatus of Suzuki. One having ordinary skill in the art would do so to increase the range of the rotational sensor (See Hamaoka col. 15, line 32 to col. 6, line 57).

Hamaoka also teaches using magnetoresistive sensors (See Hamaoka col. 17, lines 9-18). It would have been obvious at the time the invention was made to use magnetoresistive sensors in the integrated circuit of Suzuki in lieu of the Hall elements as taught by Hamaoka. One having ordinary skill in the art would do so because as noted in Hamaoka, such magnetoresistive sensors a usable in place of Hall elements in rotational position sensors (See Hamaoka col. 17, lines 9-18).

Regarding claim 28, this combination teaches the inner surface is radial (See Suzuki FIGS. 1-3, 9, 13 and 14, item 4).

Regarding claim 29, this combination teaches each of the at least two magnets has an arc-shaped configuration along the radial direction of the magnet support (See Suzuki FIGS. 1-3, 9, 13 and 14, items 2a and 2b and as modified in view of Hamaoka FIGS. 21A-21C, note magnets 145 and 146).

Claim 30

Regarding claim 30, Suzuki teaches a rotational angle detecting device comprising:

a magnet support having an inner surface and an outer surface (See Suzuki FIGS. 1-3, 9, 13 and 14, item 4);

at least two magnets attached to the inner surface of the magnet support, so that the magnets produce a magnetic field across a center of rotation, wherein the magnets are made of

ferrite-based magnetic materials and have opposite end portions in a circumferential direction about the center of rotation, and wherein the magnets are spaced from each other in the circumferential direction by gaps, wherein each of the magnets has an arc-shaped configuration along a circumferential direction (See Suzuki FIGS. 1-3, 9, 13 and 14, items 2a and 2b);

a magneto-sensitive sensor disposed within the magnetic field and arranged and constructed to detect a change of direction of the magnetic field as the magnets and magneto-sensitive sensor rotate relative to each other, wherein the magneto-sensitive sensor comprises an IC having a magneto-sensitive element, wherein the magneto-sensitive sensor outputs signals representing a relative rotational angle wherein the magneto-sensitive sensor comprises a self- contained control unit for receiving the output signals and calculating a linear angle output (See Suzuki FIGS. 1-7, 9 and 11-14, sensors 8a and 8b on integrated circuit 27 having signal processing control and components shown as integrated circuit in FIGS. 5-7 with specific components shown in FIG. 11, outputting a signal that is generally linear as shown in FIG. 12); and

wherein there is no magnetic material between an inner peripheral surface of the at least two opposing magnets and around the magneto-sensitive sensor, and between the opposite

end portions (See Suzuki FIGS. 1-3, 9, 13 and 14, note lack of magnetic material between magnets 2a and 2b and around sensors 8a and 8b).

However, Suzuki does not disclose precisely how the magnets are magnetized, the recited edge portions or the use of magneto-resistive sensors. Hamaoka teaches a rotational angle sensor comprising a pair of arc shape magnets wherein each of the magnets has a pair of opposite end faces; wherein each of the opposite end faces comprises a first surface and a second surface that are respectively inclined relative to an inner circumferential surface and an outer circumferential surface of each of the magnets by obtuse angles and are provided with a magnetization that runs parallel between the magnets (See Hamaoka FIGS. 21A-21C, note magnets 145 and 146). It would have been obvious at the time the invention was made to incorporate the end portions of the magnets and the magnetization as taught by Hamaoka in the apparatus of Suzuki. One having ordinary skill in the art would do so to increase the range of the rotational sensor (See Hamaoka col. 15, line 32 to col. 6, line 57).

Hamaoka also teaches using magnetoresistive sensors (See Hamaoka col. 17, lines 9-18). It would have been obvious at the time the invention was made to use magnetoresistive sensors in

the integrated circuit of Suzuki in lieu of the Hall elements as taught by Hamaoka. One having ordinary skill in the art would do so because as noted in Hamaoka, such magnetoresistive sensors a usable in place of Hall elements in rotational position sensors (See Hamaoka col. 17, lines 9-18).

Claim 31

Regarding claim 31, Suzuki teaches a rotational angle detecting device comprising:

a magnet support having an inner surface and an outer surface (See Suzuki FIGS. 1-3, 9, 13 and 14, item 4);

a first and second magnet attached to the inner surface of the magnet support to produce a magnetic field across a center of rotation, wherein the first and second magnet are made of ferrite-based magnetic materials and have opposing end portions in a circumferential direction about the center of rotation, and wherein the opposing end portions of the first and second magnets are spaced from each other in the circumferential direction by gaps, wherein each of the magnets has an arc-shaped configuration along a circumferential direction (See Suzuki FIGS. 1-3, 9, 13 and 14, items 2a and 2b);

a magneto-sensitive sensor disposed within the magnetic field and arranged and constructed to detect a change of direction of the magnetic field as the magnets and magneto-

sensitive sensor rotate relative to each other, wherein the magneto-sensitive sensor comprises an IC having a magneto-sensitive element, wherein the magneto-sensitive sensor outputs signals representing a relative rotational angle wherein the magneto-sensitive sensor comprises a self- contained control unit for receiving the output signals and calculating a linear angle output (See Suzuki FIGS. 1-7, 9 and 11-14, sensors 8a and 8b on integrated circuit 27 having signal processing control and components shown as integrated circuit in FIGS. 5-7 with specific components shown in FIG. 11, outputting a signal that is generally linear as shown in FIG. 12); and

wherein there is no magnetic material around the sensor and within at least on of the gaps (See Suzuki FIGS. 1-3, 9, 13 and 14, note lack of magnetic material between magnets 2a and 2b and around sensors 8a and 8b).

However, Suzuki does not disclose precisely how the magnets are magnetized, the recited edge portions or the use of magneto-resistive sensors. Hamaoka teaches a rotational angle sensor comprising a pair of arc shape magnets wherein each of the magnets has a pair of opposite end faces; wherein each of the opposite end faces comprises a first surface and a second surface that are respectively inclined relative to an inner circumferential surface and an outer circumferential surface of

each of the magnets by obtuse angles and are provided with a magnetization that runs parallel between the magnets (See Hamaoka FIGS. 21A-21C, note magnets 145 and 146). It would have been obvious at the time the invention was made to incorporate the end portions of the magnets and the magnetization as taught by Hamaoka in the apparatus of Suzuki. One having ordinary skill in the art would do so to increase the range of the rotational sensor (See Hamaoka col. 15, line 32 to col. 6, line 57).

Hamaoka also teaches using magnetoresistive sensors (See Hamaoka col. 17, lines 9-18). It would have been obvious at the time the invention was made to use magnetoresistive sensors in the integrated circuit of Suzuki in lieu of the Hall elements as taught by Hamaoka. One having ordinary skill in the art would do so because as noted in Hamaoka, such magnetoresistive sensors a usable in place of Hall elements in rotational position sensors (See Hamaoka col. 17, lines 9-18).

Claim 32

Regarding claim 32, Suzuki teaches a rotational angle detecting device comprising:

a magnet support having an inner surface and an outer surface (See Suzuki FIGS. 1-3, 9, 13 and 14, item 4);

at least two magnets positioned to produce a magnetic field across a center of rotation, wherein the magnets each include an inner and outer surface and a first and second end portion, wherein the at least two magnets are made of ferrite- based magnetic materials, further wherein each of the magnets outer surface is attached to the magnet support inner surface and each of the magnets first and second ends are spaced from each other a circumferential direction by gaps; wherein there is no magnetic material along an inner peripheral surface of the at least two magnets, and the at least two magnets are not continuous in a circumferential direction; wherein each of the magnets has an arc-shaped configuration along a circumferential direction (See Suzuki FIGS. 1-3, 9, 13 and 14, items 2a and 2b); and

a magneto-sensitive sensor disposed within the magnetic field and arranged and constructed to detect a change of direction of the magnetic field as the magnets and magnetoresistive sensor rotate relative to each other, wherein the magneto-sensitive sensor comprises an IC having a magneto-sensitive element; wherein the magneto-sensitive sensor outputs signals representing a relative rotational angle, and wherein the magneto-sensitive sensor comprises a self- contained control unit for receiving the output signals and calculating a linear

angle output (See Suzuki FIGS. 1-7, 9 and 11-14, sensors 8a and 8b on integrated circuit 27 having signal processing control and components shown as integrated circuit in FIGS. 5-7 with specific components shown in FIG. 11, outputting a signal that is generally linear as shown in FIG. 12).

However, Suzuki does not explicitly teach using magneto-resistive sensors as the magneto-sensitive elements. Hamaoka teaches using magnetoresistive sensors (See Hamaoka col. 17, lines 9-18). It would have been obvious at the time the invention was made to use magnetoresistive sensors in the integrated circuit of Suzuki in lieu of the Hall elements as taught by Hamaoka. One having ordinary skill in the art would do so because as noted in Hamaoka, such magnetoresistive sensors a usable in place of Hall elements in rotational position sensors (See Hamaoka col. 17, lines 9-18).

Claim 33

Regarding claim 33, Suzuki teaches a rotational angle detecting device comprising:

a magnet support having an inner surface and an outer surface (See Suzuki FIGS. 1-3, 9, 13 and 14, item 4);

at least two magnets attached to the inner surface of the magnet support, so that the magnets produce a magnetic field across a center of rotation, wherein the magnets are made of

ferrite-based magnetic materials and have opposite end portions in a circumferential direction about the center of rotation, and wherein the magnets are spaced from each other in the circumferential direction by gaps; wherein each of the magnets has an arc-shaped configuration along a circumferential direction (See Suzuki FIGS. 1-3, 9, 13 and 14, items 2a and 2b);

a magneto-sensitive sensor disposed within the magnetic field and arranged and constructed to detect a change of direction of the magnetic field as the magnets and magnetoresistive sensor rotate relative to each other, wherein the magneto-sensitive sensor comprises an IC having a magneto-sensitive element; wherein the magneto-sensitive sensor outputs signals representing a relative rotational angle, and wherein the magneto-sensitive sensor comprises a self- contained control unit for receiving the output signals and calculating a linear angle output (See Suzuki FIGS. 1-7, 9 and 11-14, sensors 8a and 8b on integrated circuit 27 having signal processing control and components shown as integrated circuit in FIGS. 5-7 with specific components shown in FIG. 11, outputting a signal that is generally linear as shown in FIG. 12), and

wherein there is no magnetic material between an inner peripheral surface of the at least two opposing magnets and around the magnetoresistive sensor, and between the opposite end

portions (See Suzuki FIGS. 1-3, 9, 13 and 14, note no magnetic material between items 2a and 2b and around sensors 8a and 8b).

However, Suzuki does not explicitly teach using magneto-resistive sensors as the magneto-sensitive elements. Hamaoka teaches using magnetoresistive sensors (See Hamaoka col. 17, lines 9-18). It would have been obvious at the time the invention was made to use magnetoresistive sensors in the integrated circuit of Suzuki in lieu of the Hall elements as taught by Hamaoka. One having ordinary skill in the art would do so because as noted in Hamaoka, such magnetoresistive sensors a usable in place of Hall elements in rotational position sensors (See Hamaoka col. 17, lines 9-18).

Claim 34

Regarding claim 34, Suzuki teaches a rotational angle detecting device comprising:

a magnet support having an inner surface and an outer surface (See Suzuki FIGS. 1-3, 9, 13 and 14, item 4);

a first and second magnet attached to the inner surface of the magnet support to produce a magnetic field across a center of rotation, wherein the first and second magnet each have a pair of opposing end portions, wherein the first and second magnets are made of ferrite-based magnetic materials, the opposing end portions of the first magnet being separated from

the opposing end portions of the second magnet by gaps; wherein each of the magnets has an arc-shaped configuration along a circumferential direction (See Suzuki FIGS. 1-3, 9, 13 and 14, items 2a and 2b);

a magneto-sensitive sensor disposed within the magnetic field and arranged and constructed to detect a change of direction of the magnetic field as the magnets and magnetoresistive sensor rotate relative to each other, wherein the magneto-sensitive sensor comprises an IC having a magneto-sensitive element; wherein the magneto-sensitive sensor outputs signals representing a relative rotational angle, and wherein the magneto-sensitive sensor comprises a self- contained control unit for receiving the output signals and calculating a linear angle output (See Suzuki FIGS. 1-7, 9 and 11-14, sensors 8a and 8b on integrated circuit 27 having signal processing control and components shown as integrated circuit in FIGS. 5-7 with specific components shown in FIG. 11, outputting a signal that is generally linear as shown in FIG. 12), and

wherein there is no magnetic material around the sensor and within at least one of the gaps (See Suzuki FIGS. 1-3, 9, 13 and 14, note lack of material between magnets 2a and 2b and around sensors 8a and 8b).

Claims 35-37

Regarding claims 35-37, Suzuki in view of Hamaoka teaches the features of claims 32-34 as discussed above, but not precisely how the magnets are magnetized, the recited edge portions or the use of magneto-resistive sensors. Hamaoka teaches a rotational angle sensor comprising a pair of arc shape magnets wherein each of the magnets has a pair of opposite end faces along a circumferential direction; wherein each of the opposite end faces comprises a first surface and a second surface that are respectively substantially aligned with a direction of the magnetic field and substantially aligned perpendicular to the direction of the magnetic field (See Hamaoka FIGS. 21A-21C, note magnets 145 and 146). It would have been obvious at the time the invention was made to incorporate the end portions of the magnets and the magnetization as taught by Hamaoka in the apparatus of Suzuki in view of Hamaoka. One having ordinary skill in the art would do so to increase the range of the rotational sensor (See Hamaoka col. 15, line 32 to col. 6, line 57).

***Response to Arguments***

Applicant's arguments filed December 14, 2007 with regard to the Amendments to the claims have been fully considered but they are not persuasive.

Applicants initially assert that none of the prior art references disclose or teach (1) arc-shaped magnets, (2) the end face shapes of the magnets and (3) and integrated circuit for the sensors. However, as discussed and outlined above, the prior art, at least Suzuki and Hamaoka in combination, teach precisely these features in the manner as recited in the claims.

Furthermore, Applicants have included features relating to a magnetoresistive integrated circuit with a control therein. However, Applicants have not shown or discussed how this is accomplished. Nowhere in the drawings is shown any circuit, control or processor or otherwise.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US6198276 and US5998989 each disclose magnetoresistive integrated circuits.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KENNETH J. WHITTINGTON whose telephone number is (571)272-2264. The

examiner can normally be reached on Monday-Friday, 7:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Assouad can be reached on (571) 272-2210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kenneth J Whittington/
Primary Examiner, Art Unit 2862